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Credit Union Policies and Performance in Latin America

by

Glenn D. Westley and **Sherrill Shaffer**

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Authors' Note

Glenn Westley: IDB (tel) 202-623-2448 (fax) 202-623-2481 (E-mail) glennw@iadb.org

Sherrill Shaffer: University of Wyoming, Laramie, WY 82071-3985 (tel) 307-766-2173
(fax) 307-766-5090 (E-mail) shaffer@uwyo.edu

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1. Introduction

Controlling loan delinquency is one of the most critical tasks a financial institution faces in ensuring its long term survival. Earning positive profits in order to be able to plow at least some of those profits back into the capital base of the institution is also one of the keys to building a healthy, growing financial intermediary. This paper finds a strong link between the policies adopted by credit unions (CUs) and their performance as measured on these two dimensions for a sample of CUs in Latin America. The reasons for focusing on credit unions and on these two performance measures are explained in Sections 2 and 3. Conceptual frameworks for explaining credit union loan delinquency and profitability together with the first econometric estimates of credit union delinquency and profit functions that we know of for Latin America are found in Sections 5 and 6, using the data described in Section 4. Section 7 concludes the paper.

2. Why Are Credit Unions of Interest?

In most countries of Latin America, commercial banks have shown a great reluctance to serve the lower end of the economic spectrum - micro and small enterprises and poor and working class households - which are the staple of the credit union movement in the region.[1] Providing these notoriously underserved groups[2] with better financial services offers the possibility of substantial efficiency and growth gains as well as positive equity effects.

Table 1, which summarizes all of the reasonably reliable statistics the authors could find on the subject, shows that in Latin America micro and small enterprises appear to play a much larger role in economic production than is sometimes realized. This fact, together with a growing body of evidence that increased usage of banking services is associated with greater economic efficiency and growth,[3] implies that better serving only the micro and small enterprise part of the CU target population could yield growth rate gains that are significant in macroeconomic terms. Figure 1 additionally indicates that to ignore only microenterprises is to ignore about half of the labor force of the typical Latin American country, suggesting that macroeconomically-significant employment gains may also be derived from easing constraints on microenterpise access to credit and other financial services.

[1] Credit unions often serve some middle-class households as well. Magill (1991) and Richardson and Lennon (1994) discuss and present empirical evidence on the income level of households and the size of firms served by credit unions in Latin America.

[2] Based on existing survey and other evidence, IDB (1995) estimates that less than 5% of Latin American microenterpreneurs have access to credit from the formal financial system.

[3] For example, King and Levine (1993) find that a 10 percentage point rise in the ratio of private banking system credit to GDP is associated with an increase in the annual GDP growth rate of about 1/3 of a percentage point. Ghani (1992) finds an even larger growth effect, approximately ½ of a percentage point. Westley (1994) discusses several channels through which increased intermediation may result in productivity and growth rate gains.

Table 1. Micro and Small Enterprise Share of GDP or GDP Components				
Country	**Microenterprise Share**	**Micro and Small Enterprise Share**	**Reference Year**	**Coverage**
Brazil [A]	**16%**	**43%**	**1985**	**Manufacturing, commerce, and services sectors**
Mexico [B]	**26%**	**48%**	**1993**	**All GDP**
Dominican Republic [C]	**31%**		**1991**	**All non-agricultural GDP**
Belize [D]		**39%**	**1994**	**Manufacturing, commerce, services (except government), transportation, and utilities sectors**

FIGURE 1

Microenterprise Share of Total, Non-Agricultural Employment, 1994 *

[A] Source: 1985 Economic Census. Microenterprises are defined as having 9 or fewer workers in the commerce and services sector and 19 or fewer in industry. Small enterprises have 10-49 and 20-99 workers, respectively.

[B] Source: 1993 Economic Census. Microenterprises are defined as having 15 or fewer workers, small enterprises as having 16-100.

[C] Source: Fondomicro's (extensive) national survey of microenterprises. Microenterprises are defined as those with 10 or fewer workers.

[D] Source: Central Statistical Office. Micro and small enterprises are defined as those with gross output of less than US $250,000.

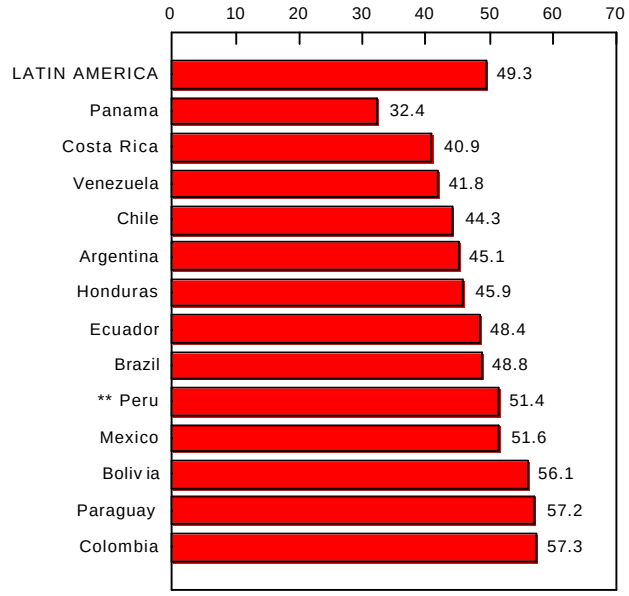
Birdsall, Ross, and Sabot (1995) discuss how activities such as providing high-quality basic education and those that increase labor demand can often help the poor disproportionately and may also have high economic rates of return, so that both growth and equity objectives can be advanced simultaneously. Providing greater access to financial services for micro and small enterprises would appear to be another avenue for furthering such shared growth. To illustrate how extending financial services to these firms could achieve this aim, consider the case of a large firm that receives financing to execute its 10 percent rate-of-return project, while the financial system fails to finance and thus frustrates the execution of a poor microentrepreneur's 25 percent rate-of-return project because the latter loan would be too small to be bankable by traditional commercial bank standards.[4]

[4]Townsend (1995, Sect. 5) discusses a variant of this channel.

FIGURE 1

Microenterprise Share of Total, Non-Agricultural Employment, 1994 *

(percentage terms)



* Source: ILO (1996, Table 1B). The ILO's calculations are based on data from household surveys and other official sources. MIcroenterprises are defined as those with less than 5 or 10 workers, depending on the country.

** Refers to metropolitan Lima only.

Credit unions are also of interest because they are full service institutions, in the sense that they both take deposits and make loans. This distinguishes them from financial NGOs, the other type of intermediary that has been widely promoted as a vehicle for reaching poorer households and smaller business with financial services. These latter institutions make loans but generally are not permitted to take deposits. Deposit-taking gives CUs great potential for growth, since unlike financial NGOs, they are not dependent on very limited, external donor funds.

As Poyo (1987) explains, credit unions in Latin America were generally set up in the 1950s, 1960s, and 1970s with a strong social welfare purpose in mind, assisting the poor. Many were organized by Catholic priests and Peace Corps volunteers. They generally lacked professional management, were weak at loan recovery and at earning and retaining profits for future expansion, and they usually kept loan rates very low in order to benefit borrowing members. Low lending rates meant that deposit rates were also normally kept low, but with substantial grant and soft loan funds available from external donors, many credit unions grew rapidly in this period anyway despite the lack of deposit mobilization, loan recoveries, and retained earnings. With the drying up of much of these donor funds in the 1980s and 1990s, the credit union movements in many Latin American countries became moribund. In those few countries in the region in which the credit union movements have regained vigorous growth and have achieved at least some significant measure of financial health, they have generally done so through an aggressive campaign to mobilize savings, combined with much stricter attention to delinquency control and a policy of earning and capitalizing profits. While successful deposit mobilization is largely a question of appropriate pricing, delinquency and profitability are more complex matters, and so have been selected as the focus of this paper.

Helping to illustrate where Latin American credit unions stand today, Figure 2 shows aggregate credit

union deposits and loans relative to those of the commercial banking system in all Latin American countries for which we could obtain data and in several industrial countries (including five of the G-7). The figure shows how severely stunted the credit union movement still is in general in Latin America, and suggests that there is a great potential for growth if appropriate policies were to be adopted.

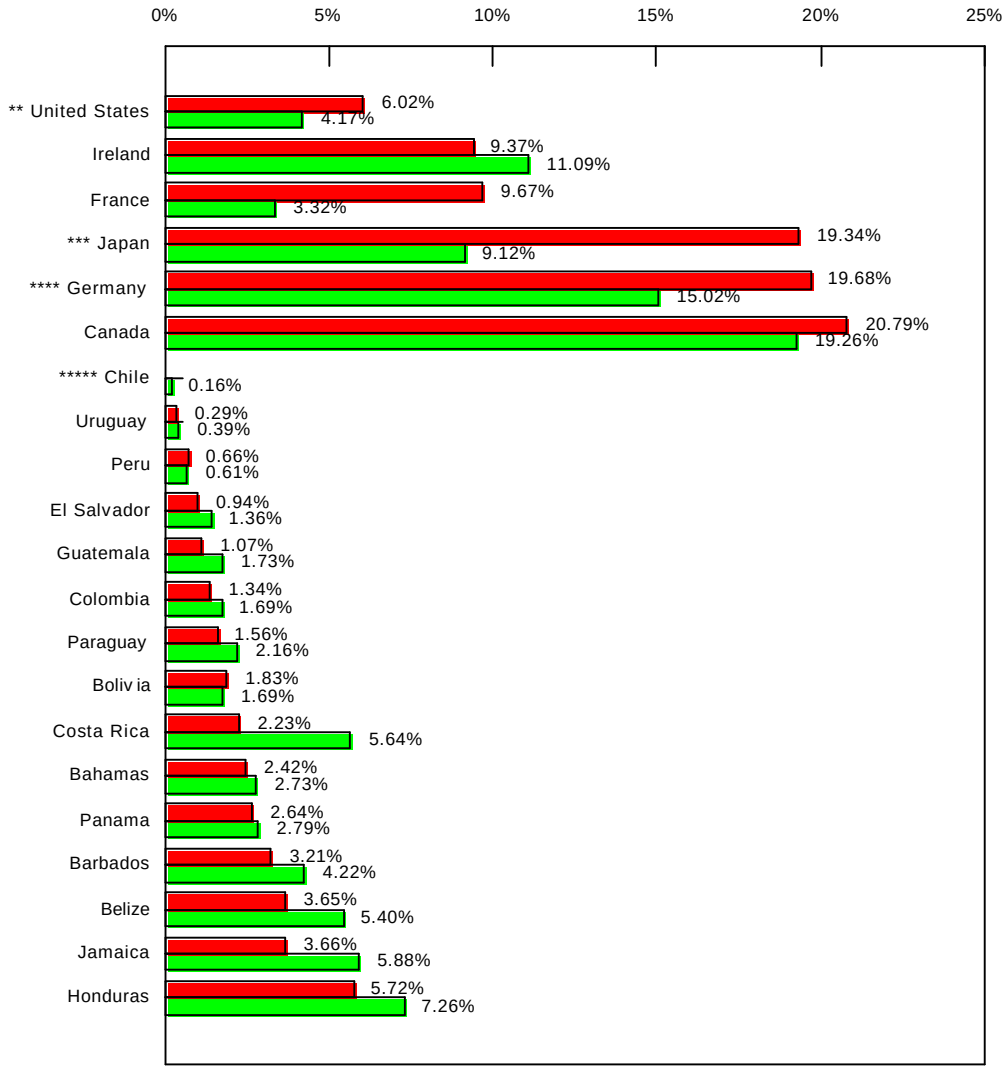
Finally, credit unions are of interest because, as Banerjee, Besley, and Guinnane (1994) have pointed out, neighbors may have better information about borrowers than bank credit officers and may in addition be better able to impose sanctions (including social sanctions) on delinquent borrowers
than banks. This gives these financial cooperatives important advantages over banks in loan screening and collection.

3. Selected Performance Measures: Profitability and Delinquency

As is true for other financial intermediaries, profits are important to credit unions in order to help build a capital base both for future expansion and to buffer negative shocks and thus help ensure long-run survivability.

Delinquency has been termed the number one killer of credit unions in Latin America, reflecting the fact that it is often a leading cause of credit union decapitalization and insolvency.[5] Credit unions that are not able to maintain reasonably low delinquency rates (certainly in the single digits and preferably under 5%) feel an immediate impact on their incomes as loans go uncollected. Next, they may see administrative costs ballooning since, when loans go bad, loan collection easily becomes the most expensive component of the loan granting/administration/collection cycle and thus adds significantly to total costs if done on any substantial share of the portfolio. Sometimes even more debilitating in the longer run is the nature of the client relationship that can develop. When delinquency is high, credit union staff can spend a great deal of their time in very negative interactions with clients, instead of in roles that foster the idea that the credit union is an institution that supports and helps its clients. This can undermine a base of customer loyalty. In addition, at high delinquency rates, a contagion effect may develop. If loan clients become aware that a significant share of borrowers are not repaying, they may ask themselves why they should repay, and may figure the credit union is not punishing delinquency very strongly or at least won t with so many members overdue on their loans. Hence, they may decide themselves not to repay. Liquidity crises may also erupt as delinquency worsens, forcing the credit union to borrow expensive short-term money (damaging profits) and/or causing restrictions in lending. Such restrictions may further increase delinquency, especially for clients that were expecting and needing a rollover. This can set up a vicious circle, with increased delinquency further deepening the liquidity crisis, and vice-versa. Finally, in addition to contributing to poor financial health in all of these ways, weak loan recovery undermines the growth and expansion of the credit union because it leads to a reduction in the availability of funds with which to extend new loans.

[5] In fact, Huppi and Feder (1990, p. 196) note that for credit unions in the developing world in general, "high delinquency rates have been the primary reason for failure."



* For each country, the upper bar gives the ratio of credit union deposits to total money plus quasi-money (unless otherwise noted, the latter is taken from the IMF's International Financial Statistics, line 34 plus line 35). The lower bar gives the ratio of credit union loans to private sector loans by the commercial banking system (the latter are taken from line 22d of the IFS except as noted). Credit union data are taken from WOCCU (1995) unless otherwise noted.

** For the U.S., thrifts are included with the commercial banking system.

*** All data for Japan are taken from Bank of Japan (1996).

**** All data for Germany are taken from Deutsche Bundesbank (1995).

***** Data refer to 1993 instead of 1994.

4. Data

Two to four years of annual data at the credit union level were collected on 58 CUs distributed across three Latin American countries: Bolivia, Guatemala, and Honduras. Countries, credit unions, and years were selected specifically to be those for which reasonably accurate and consistent balance sheet, income statement, and delinquency rate data were available. The existence of such information was directly attributable to the credit union strengthening programs carried out by the World Council of Credit Unions (WOCCU) since 1987 in Guatemala and Honduras and since mid-1993 in Bolivia on a group of CUs in each country. The great diversity both within and across countries in the success of these programs in strengthening financial discipline and management, and in improving delinquency, profitability, and savings mobilization performance imparted a huge range of variation to most of the variables in our data set. For example, delinquency rates varied from a low of 1.3% for a credit union in Guatemala to a high of 49% for one in Bolivia. In general, the delinquency and profitability performance of the Bolivian credit unions was the weakest (reflecting the recency of the strengthening program there), while that of Guatemalan credit unions was the strongest, particularly with regard to delinquency.

The data used in this study were obtained from three major sources. The International Monetary Fund's *International Financial Statistics* provided most of the macroeconomic series, occasionally supplemented by data from national sources. The WOCCU technical assistance team in each of the three countries provided balance sheets, income statements, delinquency data, locality population data (based for each country on a recent population census), and a classification of each credit union as either borrower dominated, saver dominated, or neutral.[6] A 17-page written survey questionnaire, filled out by the manager of each participating credit union (or occasionally his/her delegate), provided information on that credit union's delinquency control measures; the breakdown of its loan portfolio by sector, type of guarantee, and branch; loan and deposit rates; wages and employment; and data on membership and the number of banks and other financial institutions in the same locality. Of the 69 credit unions to which surveys were distributed, 58 were returned and usable. This high 84% response rate is attributable in part to the efforts of the WOCCU technical assistance teams, which distributed and collected the surveys, and exhorted credit unions to fill them out thoroughly and accurately despite the four to six hours it normally took to do so. A telephone follow-up was made with every participating credit union by one of the authors in order to fill in and verify any missing or suspicious-looking information. Given that a few isolated problems were later discovered with some of the balance sheet and income statement information, data for 55 credit unions were ultimately used in this study: 18 in Bolivia, 15 in Guatemala, and 22 in Honduras. With certain averaged and lagged variables consuming the first observation for each country, our regression analysis is based on data for 1994 in Bolivia and for 1992-94 in Guatemala and Honduras, with a total of 126 observations.

5. Explaining Delinquency

As a general matter, we find that delinquency depends in important ways on credit union policy variables, particularly those that affect borrower repayment incentives. Happily, this means that credit unions have great scope to motivate loan clients to choose not to default.

A model in which borrowers elect whether or not to repay their loans in a timely fashion in order to maximize their expected lifetime utility is a useful lens through which to view this general result. In such a model, loan clients choose to default if defaulting has greater expected utility than not defaulting. To make this decision, borrowers trade off the value of not repaying principal and interest on the current loan against the value and probability of obtaining future loans, of using other potentially valuable credit union services such as savings facilities, and of avoiding sanctions.

In addition to highlighting the importance of credit union policy variables that operate by affecting borrower repayment incentives, our empirical analysis also finds a considerable role for CU policy variables that affect delinquency because they impact the credit unions' capacity to effectively screen loans.

We now present a number of specific microeconomic hypotheses on the determinants of credit union

[6] This categorization was subjective but based on intimate knowledge of the politics of each credit union. The subjective classification was corroborated by loan and deposit rate data. Neutral credit unions are those roughly balanced between the interests of savers and borrowers.

delinquency rates, as well as our regression results (the latter in Table 2).[7] In general, these regression results are quite robust to the choice of explanatory variable sets, with the inclusion or exclusion of variables generally not affecting the sign of the remaining variables or whether they are significant at about the 5% level. Such robustness reflects the low degree of multicollinearity present in these largely cross-sectional data. The following variables are consistent in their sign and generally in their significance throughout the regression analysis.

a) Real deposit rate (RSDTD). Higher real deposit rates motivate loan repayment in two ways. First, they increase borrower incentives not to lose access to the credit union's savings services by defaulting since these services have greater value at higher real rates. Second, by improving deposit mobilization, higher real deposit rates reduce the often severe problem of loan rationing, thus increasing a non-defaulting borrower's probability of obtaining future loans when (s)he would like one. Reducing loan rationing may also discourage a culture of insider lending, favoritism, and even corruption - a culture that can result in poor loan selection, weak collection efforts, and high delinquency rates.

b) Credit union effective loan rate minus commercial bank loan rate (ILDIFE).[8] *A priori* the direction of this variable's effect is unclear. Lower CU loan rates may discourage repayment by creating a condition of excess credit demand, thus increasing the likelihood of future loan rationing and the culture of insider lending referred to above. On the other hand, the direct savings are lower when a borrower defaults on a low interest rate loan. Also, following Stiglitz and Weiss (1981), lower lending rates may avoid an adverse selection of borrowers and thus contribute to lower delinquency rates. In the regression analysis, we consistently find that the first argument prevails, with credit union loan rates always negatively associated with CU delinquency rates.[9]

c) Ratio of the CU's average wage rate to the average wage rate prevailing in the country's financial sector (RELWAGE). Behind this variable is an efficiency wage hypothesis. A chronic problem in credit unions in Latin America is that wage levels are often held down by a membership that compares their own income levels to those of the credit union officials. Low CU wage levels relative to those paid elsewhere in the financial sector may result in low effort and morale, high turnover, and a general inability to recruit and retain high quality credit union staff. Poorer loan selection and weaker recovery efforts may result, the latter reducing the incentives for borrowers to repay. Both factors tend to increase delinquency rates. As an example of this phenomenon, Arbuckle (1994, p. 34) notes that in the case of Honduras, "The biggest obstacle to rational personnel policies is the fear of board members that General Assemblies may protest that high performing managers and staff are too highly paid."

d) The CU's return on assets, lagged one year (ROA1). Return on assets is a measure of the credit union's financial health. Incentives to repay loans diminish greatly if borrowers believe that the credit union may not survive to offer them loan and savings services in the future, or may only survive with greatly diminished capacity to offer loans, for example. While credit union financial health is not a policy variable per se, a basic hypothesis of this paper is that it is strongly influenced by the set of policy variables being discussed here.

Table 2. Delinquency Regressions [1]

	1	2	3

[7] Variable definitions for the delinquency (and profit) regressions are given in Table 3.

[8] The effective loan rate refers to the fact that most credit unions in our sample require that the borrower deposit a certain fraction of the loan amount in a share deposit account. The effective loan rate is calculated as the ratio of the amount of net interest paid to the net loan proceeds.

[9] A significantly negative coefficient is also consistently obtained when the effective credit union loan rate appears in the regression in real terms instead of in the ILDIFE difference form.

RSDTD	-.00363 (2.87)	-.00299 (2.37)	-.00283 (2.24)
ILDIFE	-.00427 (2.73)	-.00473 (3.06)	-.00422 (2.67)
RELWAGE	-.0568 (2.26)	-.0674 (2.69)	-.0911 (3.97)
ROA1	-.284 (1.44)	-.298 (1.54)	-.344 (1.77)
GRACE	.000483 (5.58)	.000461 (5.41)	.000432 (5.09)
FINLAG	.00714 (5.49)	.00667 (5.18)	.00687 (5.38)
FINPERIOD	.0295 (3.29)	.0281 (3.18)	.0270 (3.05)
LNPOPM	.0127 (2.61)	.0142 (2.96)	.0118 (2.33)
CHARGE-OFF	-.000476 (2.76)	-.000364 (2.08)	
MORTMOVE		-.0739 (2.42)	-.0950 (3.22)
LOANS$/EMP			.000000357 (2.04)
Constant	.00716 (.14)	.0376 (.73)	.0474 (.91)
R^2	.5608	.5824	.5819

[1] Ordinary least squares estimates, with t-statistics in parentheses.

Table 3. Variable Definitions

Delinquency Regressions

DELINQ	loan delinquency rate, measured as the contaminated portfolio at end of year
ILDIFE	(CU effective loan rate) - (commercial bank loan rate, national average), annual %
RELWAGE	(CU average wage level)/(average wage level in the country's financial sector)
ROA1	CU's return on assets, lagged one year (decimal terms)
RSDTD	stock weighted average of real savings and time deposit rates, from quarterly data (annual %)
GRACE	grace period before monetary penalties are imposed on late loan payments (in days)
FINLAG	number of days after close of month (or other accounting period) before financial reports are ready
FINPERIOD	period (in months) between financial reports
LNPOPM	ln(weighted average population of localities in which CU main and branch offices are located, weighted by number of members in each office)
CHARGE-OFF	percentage of loans more than one year overdue that are charged off
MORTMOVE	share of loans that are collateralized either by real or movable property (decimal terms)
LOANS$/EMP	(average yearly loan stock in December, 1993 dollars)/(average number of employees for the year)

Profit Regressions

p	real profits, in 1993 U.S. dollars
p_h	real, *ex post* interest rate on investments (annual %), deflated by local CPI
p_l	real, posted loan rate, from quarterly data (annual %), deflated by local CPI
p_d	real, *ex post* interest rate on all deposits, shares, and borrowing (annual %), deflated by local CPI
p_w	real average wage rate, in 1993 U.S. dollars
p_m	real price of materials (i.e., of non-wage administrative costs), defined as the ratio of nominal non-wage administrative costs to nominal total assets
x_F	real value of fixed assets, in 1993 U.S. dollars
MORTGAGE	share of loans that are collateralized by real property (decimal terms)
SAVER	dummy variable, =1 for saver-dominated credit unions, =0 otherwise
NEUTRAL	dummy variable, =1 for neutral credit unions, =0 otherwise
GGDP	growth rate of real GDP (annual %)
INFLAT	December-over-December consumer price inflation rate (annual %)
AREERCH	absolute value of the December-over-December percentage change in the real effective exchange rate (annual %)
CRBOOM1	CRBOOM lagged 1 year, where CRBOOM is a measure of whether there is a commercial bank credit boom in the current year. CRBOOM = [1+c]/[(1+r) (1+g)], where c is the growth rate of commercial bank credit to the private sector (in nominal terms), r is the nominal commercial bank loan rate, and g is the growth rate of real GDP. Expressed as an annual %.

While there are many measures of financial health, profits are followed with special interest by credit union members, who normally hold an annual assembly around March of each year to decide on dividend distributions from the preceding year's profits. Profits are normalized here by assets to control for credit union size, and ROA is lagged one year to reflect the fact that members generally would gauge the health of a credit union by last year's profitability, which is what is readily available to them in the current year.[10] Alternative measures of credit union health, such as the growth of the number of members, real assets, or real voluntary (savings plus time) deposits, all had the proper sign but were less significant than ROA1 in the regression analysis.

e) Severity of default sanctions. All of the variables discussed up to now except the wage ratio relate primarily to the benefits to members of maintaining access to loan and deposit services (the carrots offered by credit unions), as weighed against the cost of repaying the loan. The other variables in Table 2 are principally concerned with different aspects of the remaining dimension of the expected utility framework described earlier, the severity of default sanctions (the credit unions 'sticks).

Loans collateralized with real or movable property should have lower default rates than signature loans because of the additional threat to the borrower's assets, a hypothesis that is confirmed in the present study by the significantly negative sign on the variable MORTMOVE. Monetary penalties (late loan charges) can also be important deterrents to delinquency, at least for loans members might intend to repay eventually. While the penalty interest rate was correctly signed, it was never very significant in the regression analysis. The length of the grace period before such penalties were imposed (the variable GRACE, which ranged in value from 1 to 360 days) was, however, highly significant. This may reflect the fact that borrowers contemplating temporary (or potentially temporary) default may focus more on whether there are any consequences to their actions in the short run - and hence on the length of the grace period - rather than on the precise amount of the penalty that would eventually be assessed. Moreover, GRACE is the only variable relevant to borrowers who pay overdue installments before late charges begin.

Credit unions are cooperative entities that generally do not attempt to maximize profits, and in fact will often not be subject to the rule of the market that capital will forsake them if they consistently earn low or even negative profits; many members will stay and even contribute additional share capital if they receive sufficient benefits (that they could not obtain elsewhere). And because credit unions frequently do serve groups that have no other real options for obtaining financial services, these institutions are often not forced to achieve high levels of X-efficiency by the threat that most of their customers (and their customers 'capital) will desert them. This problem of inadequate market discipline to enforce efficient management is frequently compounded by the lack of business acumen and management skills and training of the teachers, priests, and other non-professionals who have often been called upon to direct and manage credit unions and by the relative lack of financial and business sophistication of the members who elect the governing board.[11] A common result of this situation is that a credit union enters into a crisis and realizes that it must control delinquency if it is to survive. For a while, the credit union bends great energy to this end. Then, once the arrearage problem becomes less urgent it shifts its focus to improving financial management, cost controls, member services, or other tasks. Market and internal controls are often insufficient to force the credit union to do all of these things simultaneously.

What this means for our analysis is that variables that reflect the seriousness with which the credit union treats arrearages may well be important for explaining the observed variation in credit union delinquency rates. It also implies that there may be substantial differences across credit unions and over time in how well a serious

[10] Intra-year profit reports are prepared in some of the better credit unions, but this information is not normally available to the membership, which we assume is also not financially sophisticated enough to gauge ROA in the current year by any better measure than last year's value. When, in fact, current year ROA is used in the regression, it is less significant than ROA1. (When ROA is used, the two-stage least squares estimator is also employed, taking ROA as endogenous since higher current delinquency rates tend to drive down current ROA. When ROA1 is used, ordinary least squares is employed since lagging eliminates this simultaneity problem.)

[11] It is because the board of directors and management frequently lack skills and knowledge, yet often possess a great desire to serve their members, that credit union strengthening programs, such as those alluded to in Section 4, can be so valuable.

repayment culture has been established, in which members are, for example, encouraged and lectured (repeatedly) about the importance of repayment and in which immediate phone calls and letters followed by solemn interviews and demands against the property of those who fall into default are commonly- and perhaps even uniformly-followed procedures. While its presence is likely to be important, measuring the extent to which there actually *is* a serious culture of repayment in a credit union is a formidable task. It is difficult to quantify even the above-noted procedural variables with accuracy over all loans in a given time period, and perhaps the most important determinant of all, the attitude within the credit union toward delinquency, presents even thornier measurement problems.

The variable FINPERIOD gives the period (in months) between financial reports, while FINLAG gives the number of days after the close of the month or other accounting period before financial reports are ready. While most credit unions prepare financial reports every month, some have intervals of 2, 6, and even 12 months between reports. And while the average credit union has its financial reports ready about 12 days after the close of the previous accounting period, in some CUs the delay is as long as 40 days. A large value for either variable is an indicator of lax management in general, and may well in addition indicate the lack of a serious repayment culture, as is suggested by the significance and robustness of these two variables in the delinquency regressions. The variable CHARGE-OFF, which gives the percentage of loans more than one year overdue that are charged off, may provide an additional tip-off to a credit union that does not deal with delinquency in a serious manner. Credit unions that are purposeful about loan collection are also normally serious about keeping track of their successes and failures, in the proper accounting framework. While loans more than one year overdue should generally be charged off, many CUs keep them on the books long after this. The staff and members of such credit unions are usually not imbued with a serious repayment culture. In summary, our empirical analysis finds that higher values of FINPERIOD and FINLAG and lower values of CHARGE-OFF are associated with higher delinquency rates, apparently indicating a weak culture of repayment.[12]

The variable LOANS$/EMP, which gives the average stock of loans expressed in December, 1993 dollars per credit union employee, is an inverse measure of the human resources available to do loan screening, administration, and collection. As expected, more resources reduce delinquency. Finally, the variable LNPOPM, which gives the natural log of the population of the town in which the credit union is located,[13] consistently enters the regression with a significantly positive sign. This result, which implies that, *cet. par.*, delinquency rates are higher in cities than in small towns, may reflect the greater social controls that operate in the latter. It may also reflect the fact that credit unions in our sample of countries suffered huge losses in donor-sponsored, small agricultural lending programs which ended prior to our sample period (in the mid- to late-1980s). The memories of these experiences are still vivid, and so credit unions are likely to have been exercising special caution in their lending to agriculture and agriculture-related activities during our sample period. This together with the 1994 coffee price boom and the fact that real agricultural value added grew reasonably well during the sample period years (though usually more slowly than real GDP) may account for the observed sign on LNPOPM.

Quantitative Importance of the Results

Utilizing the descriptive statistics given in Table 4 and the regression coefficients in Table 2, it is easy to see that reasonable size changes in the explanatory variables are associated with numerically important changes in the delinquency rate. To illustrate, 10 percentage point increases in credit union deposit and loan rates reduce delinquency rates by 3 and 4 percentage points, respectively. Increasing ROA1 by 0.10 (a reasonable increment since this variable ranges from -0.30 to 0.11) reduces delinquency by 3 percentage points. A 20 percentage point increase in the share of the loan portfolio collateralized by real or movable property is associated with a fall in

[12]The fact that credit unions with higher values of CHARGE-OFF purge their loan portfolios more thoroughly of very overdue loans may contribute in a purely mechanical way to reducing measured delinquency rates (reducing the numerator and denominator of the delinquency ratio by equal amounts). This may be an alternative or an additional explanation to the one offered in the text.

[13]Or the log of the weighted average of the town populations if the credit union has branches; see Table 3.

the delinquency rate of 1.5-2 percentage points. Increasing relative credit union wages (a variable that ranges from 0.27 to 1.68) by 0.5 drops delinquency by 3 to 5 percentage points.

Sensitivity Analysis

The sign and significance of the variables in Table 2 are robust to a wide variety of changes in the regression specification. As noted earlier, fairly substantial changes can be made in the sets of variables included in and excluded from these regressions without affecting the sign of the remaining Table 2 regressors or whether they are significant at about the 5% level.

The dependent variable in all regressions is the delinquency rate at the end of the year. All explanatory variables measure average conditions during the preceding 12 months, which shape both borrower decisions to default and the more recent loan selection decisions (the average loan term being about 20 months). The sign and significance of our results are robust to using two-year averages for independent variables instead of a one-year measure.[14]

The delinquency rate measure employed is the share of the loan portfolio with any payments one day or more overdue. This is the definition actually used in Guatemala in 1993-94 and in Bolivia. Honduras employed a 60-day cutoff in all years and Guatemala a 30-day cutoff in 1992. For purposes of comparability, Honduras 'reported delinquency rates were increased by 6 percentage points and Guatemala's 1992 rates were increased by 3 percentage points prior to the regression analysis. These adjustments were based on data from a sample of credit unions in which delinquency rates were calculated with multiple cutoffs. We also ran regressions with adjustment factors of 4% and 2% (instead of 6% and 3%, respectively) and with no adjustment at all, the last on the hypothesis that behavior would adjust to whatever the delinquency definition is, so that Bolivian credit unions would press their members just as hard on the first day of delinquency as the Honduran credit unions would on the 61st day. These changes in the dependent variable had little effect on the regression results.

The dependent variable, by definition, cannot go outside the [0,1] range, and, in fact, all dependent variable observations fell in the [.013, .49] interval. To remedy the truncated normal error imposed by the [0,1] limitation, we tried several transformations of the dependent variable: ln(d), ln[d/(1-d)], and ln[d/(c-d)], where c=0.5, 0.6, 0.7, 0.8, and 0.9 and d=the delinquency rate. This produced exceedingly little change in the regression results. Signs were unchanged and the same variables were significant, with t-statistics typically varying by only 0.1-0.4 or less and the R^2 changing by less than 0.01. For simplicity of interpretation, we have reported the linear equation results.

Table 4. Means, Standard Deviations, Minimums, and Maximums

VARIABLE	*MEAN*	*STD. DEV.*	*MINIMUM*	*MAXIMUM*
DELINQUENCY REGRESSIONS				
DELINQ	.189	.115	.0131	.490
GRACE	47.6	85.2	1	360
FINLAG	12.24	6.52	2	40
FINPERIOD	1.14	1.08	1	12
ILDIFE	4.58	6.64	-7.18	55.54
RELWAGE	.804	.352	.272	1.680

[14] We retain the one-year measures since they are consistently more significant and yield higher R^2 values.

ROA1	.0108	.0430	-.298	.109
RSDTD	-1.78	6.31	-16.5	8.60
LNPOPM	10.07	1.647	7.364	13.96
CHARGE-OFF	57.0	46.7	0	100
MORTMOVE	.428	.258	0	.995
LOANS$/EMP	57,061	44,873	6170	230,065
PROFIT REGRESSIONS				
$\mathbf{p}$	24,927	73,529	-282,560	335,182
$\mathbf{p_h}$	25.79	69.56	-21.15	535
$\mathbf{p_l}$	8.24	7.93	-10.01	43.1
$\mathbf{p_d}$	-4.07	6.14	-18.1	6.54
$\mathbf{p_w}$	2193	984	752	6730
$\mathbf{p_m}$	4.11	2.33	-1.10	12.1
$\mathbf{x_F}$	83,162	140,068	3212	1,076,889
MORTGAGE	.387	.239	0	.995
SAVER	.111	.316	0	1
NEUTRAL	.190	.394	0	1
GGDP	3.81	2.54	-1.40	6.23
INFLAT	13.6	7.48	6.50	28.9
AREERCH	7.12	2.73	.760	10.2
CRBOOM1	-5.92	7.70	-16.1	5.53

Our conclusions are also robust to other formulations of the independent variables. For example, loan and deposit rates can be used in real terms (deflating by the December-to-December increase in the local consumer price index) or as the difference between nominal credit union and commercial bank rates. Deposit rates can also be based on voluntary (savings plus time) deposits only or may also include share accounts.[15]

The method of estimation made little difference. For example, estimating delinquency equations jointly with the profit functions (and associated share equations) discussed in the next section using the seemingly-unrelated-regressions (SUR) method made very little difference to either the delinquency or the profit functions, as compared to estimating each in isolation. Including country or (country x year) dummies had little impact on the delinquency regression coefficients. Moreover, the dummy variables were insignificant individually and as a group in the many delinquency specifications in which they were tried. Finally, dropping all observations for Bolivia (on grounds that the data were weakest there) did not change any of our conclusions, and the Chow test indicated that the regressions were the same with and without these data points.

The Scoring Literature

There exists a large literature estimating delinquency (or "scoring") equations for commercial bank

[15] In share accounts the funds are not available to members until they leave the credit union. None of the credit unions were permitted to offer demand deposits.

lending and credit card accounts.[16] There appear to be no published studies estimating delinquency equations for credit unions, in either the developed or developing country literature.

Our delinquency equations differ from the existing scoring literature in their emphasis on policy variables and the incentives these policies create for borrowers to repay. With credit union delinquency rates in our sample generally at very high levels (reaching almost 50% and averaging nearly 20%) despite generally favorable macroeconomic conditions, it would seem to be essential to explore delinquency from the point of view of the borrower's decision of whether to repay. This is in contrast to the scoring literature which does not generally emphasize bank policy variables and their effect on repayment incentives, focusing instead on such variables as borrower characteristics, including financial ratios that measure ability to repay.

6. Explaining Profitability

A Translog Model

Following Hancock (1991), we estimate the short-run translog profit function shown in equation (1), together with all but one of share equations (2), subject to the usual homogeneity and symmetry constraints in (3) and (4).[17] The profit function we use is based on the intermediation model developed by Klein (1971) and Sealey and Lindley (1977). It includes a number of policy and other variables as intercept shifters, these being denoted as the S_q in equation (1). The five p_i price variables consist of two

$$\ln p = A + \sum_{q=1}^{Q} d_q S_q + \sum_{i=1}^{5} a_i \ln p_i + a_F \ln x_F + 1/2 \sum_{i=1}^{5}\sum_{j=1}^{5} b_{ij} \ln p_i \ln p_j + \sum_{j=1}^{5} b_{jF} \ln p_j \ln x_F + 1/2\, b_{FF} (\ln x_F)^2 + u \qquad (1)$$

$$\frac{p_i x_i}{p} = a_i + \sum_{j=1}^{5} b_{ij} \ln p_j + b_{iF} \ln x_F + u_i \qquad \text{for } i = 1,...,5 \qquad (2)$$

$$\sum_{j=1}^{5} b_{ij} = 0 \quad \text{for } i = 1,...,5 \; ; \qquad \sum_{j=1}^{5} b_{jF} = 0 \; ; \qquad \sum_{i=1}^{5} a_i = 1 \qquad (3)$$

$$b_{ij} = b_{ji} \qquad \text{for } i = 1,...,5 \text{ and } j = 1,...,5 \qquad (4)$$

output prices (for loans and investments) and three input prices (for deposits plus borrowing, wages, and materials).[18] Fixed capital is denoted by x_F, the profit equation constant term by A, and white-noise, possibly contemporaneously-correlated disturbances by u and the u_i. Profits, fixed capital, and the five price variables are

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[16] For the U.S. literature, see for example Avery *et al.* (1996), Altman and Haldeman (1995), Asch (1995), and Boyes, Hoffman, and Low (1989), and references contained therein. For developing country scoring functions, see for example Viganò (1993) and the references contained there.

[17] For other studies estimating bank profit functions see Berger, Hancock, and Humphrey (1993) and the references contained therein. The only study we know of that estimates a profit function for credit unions is Beshouri and Glennon (1996), which uses a sample of U.S. credit unions and a loglinear profit equation.

[18] Materials refer to all non-wage administrative costs. Loans were not broken into more than one output variable because the rates charged were usually the same or nearly the same for all types of loans, so that the resulting price series would be highly collinear. Deposits and borrowing were combined because the amount of borrowing was in general not very large and, in fact, was zero for numerous credit unions, so that an implicit borrowing rate could not have been defined for many of our observations. For ease of reference, we henceforth refer to deposits plus borrowing as deposits.

all measured in real terms, using the local consumer price index (CPI) for deflation in every case except for the price of materials.[19] In addition, for cross-country comparability, profits, wages, and fixed capital were all converted to 1993 U.S. dollars, a year in which the exchange rate was in reasonable equilibrium in the three countries, preceding, for example, the exchange rate overvaluation in Guatemala and Honduras from the 1994 coffee boom. Finally, *ex post* or implicit nominal interest rates for investments and for deposits plus external borrowing were obtained by dividing the annual amount of interest by the average yearly stock. In contrast, posted rates were used for the nominal loan rate in order to allow policy variables to affect profits through changes in repayment rates, a key channel we wish to explore.[20]

Translog Model vs. Translog Model with Slack

The implicit assumption behind estimating equations (1) - (4) is that while credit unions normally do not maximize profits unconditionally they are nonetheless efficient in the sense that they maximize profits conditional on the vector of prices they select, and thus their profit-price vector *is* located on the profit frontier. This distinction is best understood with reference to the theoretical treatment of the credit union objective function by Smith, Cargill, and Meyer (1981) and Smith (1984). These papers analyze how credit unions would set their loan and deposit rates with different possible objective functions.

For example, in the case of a purely borrower-dominated credit union - that is, one which is run in order to maximize benefits to borrowers - the credit union will minimize its loan rate subject to the sustainability constraint that profits cannot go below zero. More fully, such credit unions can be thought of as setting their loan and deposit rates so as to maximize profits and then using the full amount of these profits to reduce loan rates, stopping only when profits are at their lower bound of zero. Considering the broader set of policy decisions real-world credit unions must make, a borrower-dominated CU will serve the interests of its borrowers best by being completely efficient in all ways and then using the full amount of profits earned to subsidize the loan rate, changing the mix of inputs and outputs as necessary to maximize profits given the new loan rate. Since it is always possible for the credit union to drop its loan rate *below* the going market rate, this behavior is perfectly feasible.

In the same way, a purely saver-dominated credit union can be thought of as maximizing profits and then using any positive profits to increase the rate paid on deposits to levels above the market rate. It will select input and output ("netput") combinations that maximize profits conditional on this new price vector and will continue to increase deposit rates (and reset netput levels accordingly) until its maximized profits are driven to zero. This would be the strategy that would most benefit the savers, in whose interest the credit union is being run. Credit unions that are balanced somewhere between the interests of savers and borrowers would also find it in their interests to be efficient given whatever choice of supra-market deposit rate and sub-market loan rate the two groups, with their relative strengths, decide upon. On the assumption, then, that credit unions maximize profits conditional on their vector of netput prices, one may estimate equation system (1) - (4).

As noted in Section 5(e) above, the Smith, Cargill, and Meyer (1981) and Smith (1984) descriptions of credit union behavior may be too idealized. Credit unions may fail to be even conditionally efficient because financially unsophisticated members choose inexperienced non-professionals as directors and managers who may

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[19] The real price of materials was defined as the ratio of non-wage administrative costs to total assets, both measured in nominal terms. Using this value ratio makes the Leontief-type assumption that the quantity of materials per real peso of total assets is fixed, so that any variation in the value ratio is due to relative price variation. In effect, then, the price of total assets is used to deflate the price of materials. Given that even with the moderate 6-30% inflation rates experienced by the countries in our sample over the study period years most price indices tend to move together with a fairly common trend, this deflation procedure is probably a reasonable one. No direct measure of the nominal price of materials was available. Because negative values were assumed for some observations by the real prices of investments, loans, deposits, and materials, and by profits, 100 was added to all observations of these four real price variables and 1,000,000 to all profit data prior to taking logs. In addition, to facilitate regression coefficient interpretation, profits, fixed capital, and all five price variables were centered around zero after taking logs. This means, for example, that $\sum_{g=1}^{126} \ln(p_g \% 1{,}000{,}000)/126$ was subtracted from all 126 of the $\ln(p_g + 1{,}000{,}000)$ dependent variable observations. Table 4 provides statistics on variables prior to any of these rescalings or log transformations.

[20] Because the credit unions in this study received little income from loan commissions and fees, the major difference between posted and implicit loan rates is from loan default.

then fail to control costs and push outputs to profit-maximizing levels. In addition, credit unions that are borrower dominated or at least consider the interests of borrowers may choose to keep loan rates high but be lax on loan collection as an alternative way to benefit the borrowers, and one that yields less than maximum profits at the given vector of prices. In such cases, a variant of the translog profit equation system is called for, which reflects such slack or inefficiency.

The variant utilized here is the profit function analogue to Mester's (1989) separable-expense-preference cost function. It is derived in the same way that Mester derives her cost equation, only employing Hotelling's lemma (for profit functions) instead of Shephard's lemma (for cost functions).[21] The resulting profit function is given by equation (5), with share equations shown in (6), all subject to the homogeneity and symmetry constraints of equations (3) and (4).

$$\ln p = A + \sum_{q=1}^{Q} d_q S_q + \sum_{i=1}^{5} a_i \ln p_i + a_F \ln x_F + 1/2 \sum_{i=1}^{5}\sum_{j=1}^{5} b_{ij} \ln p_i \ln p_j + \sum_{j=1}^{5} b_{jF} \ln p_j \ln x_F + 1/2\, b_{FF} (\ln x_F)^2 + \ln\left[1 + \sum_{i=1}^{5} c_i \left(a_i + \sum_{j=1}^{5} b_{ij} \ln p_j + b_{iF} \ln x_F\right)\right] + v \qquad (5)$$

$$\frac{p_i x_i}{p} = \left(a_i + \sum_{j=1}^{5} b_{ij} \ln p_j + b_{iF} \ln x_F\right)(1 + c_i) \Big/ \left(1 + \sum_{k=1}^{5} c_k \left[a_k + \sum_{j=1}^{5} b_{kj} \ln p_j + b_{kF} \ln x_F\right]\right) + v_i \qquad \text{for } i = 1,\ldots,5 \qquad (6)$$

The only difference between the ordinary translog profit function in (1) and the slack translog profit function in (5) is the addition of the ln[1 + ...] term at the end of equation (5), a term which itself contains five additional parameters, the c_i. The c_i are markup factors; if a (conditional) profit-maximizing credit union would have used/produced x_i^* of the ith netput, a slack (non-maximizing) credit union would use/produce $(1 + c_i)x_i^*$ instead, where c_i is constant across credit unions but is allowed to take on different values for each netput. Given the log form of the profit function, the bracketed [1 + ...] expression in equation (5) is the ratio of profits in the slack credit union divided by what profits would have been if the credit union had been efficient. This ratio might reflect, for example, that a slack CU could have been using more inputs or producing less output than would an efficient CU.

Empirical Results

The estimated profit equations shown in Table 5 include an ordinary translog (regression 4) and a slack translog (regression 5). Instead of denoting the netput prices as $p_1,\ldots,p_5$, they are for ease of identification denoted as p_h, p_l, p_d, p_w, and p_m, which are the prices pertaining to investments, loans, deposits plus borrowing, wages, and materials, respectively. Intercept shifters, defined in Table 3, are denoted in uppercase.

Many of the variables that were significant in the Table 2 delinquency regressions are also significant in the profit regressions, with either an identical form of the delinquency equation variable or a slight variant of it appearing in the profit regressions. Thus, deposit, loan, and wage rates are in both equations, as are the variables FINPERIOD and LNPOPM. The variable MORTGAGE in Table 5 is variant of MORTMOVE from

[21] The derivation is available from the authors upon request.

Table 2 (the latter including loans collateralized by movable as well as real property). Still, several variables that were significant in the delinquency regressions are not significant in the profit regressions. This most likely reflects difficulties of multicollinearity in the profit regressions, which have some 40 parameters.

Turning first to the intercept shifters, higher values of FINPERIOD and LNPOPM are found to reduce profits, as would be expected since they are also associated with higher delinquency rates (Table 2). Longer periods between financial statements (i.e., higher values of FINPERIOD) may also diminish the credit union's ability to control costs and thus further contribute to reducing profits.

Table 5. Profit Regressions [1]

	4		5			4		5	
Variable	Estimate	t-statistic	Estimate	t-statistic	Variable	Estimate	t-statistic	Estimate	t-statistic
Constant	-.0636	1.02	.0591	.20	$\ln p_l \ln$	-6.02	1.13	-8.32	1.33
FINPERIOD	-.0235	1.58	-.0193	1.28	$\ln p_l \ln$	-.210	.39	-.0775	.14
LNPOPM	-.00846	2.26	-.00675	1.86	$\ln p_l \ln$	-4.31	1.21	-4.99	1.46
MORTGAGE	.0861	1.18	.126	1.77	$(\ln p_d)^2$	1.88	.29	2.97	.38
(MORTGAG	-.109	1.37	-.160	2.07	$\ln p_d \ln$	.420	.84	.282	.55
SAVER	.0368	2.05	.0338	1.93	$\ln p_d \ln$	3.21	1.03	5.03	1.85
NEUTRAL	.0164	1.19	.00612	.45	$(\ln p_w)^2$	.0958	1.81	.0975	1.71
INFLAT	.0104	4.15	.0135	5.25	$\ln p_w \ln$	-.383	1.65	-.371	1.85
AREERCH	-.00425	1.45	-.00493	1.74	$(\ln p_m)^2$	2.27	.79	.829	.47
GGDP	.00962	1.80	.00633	1.29	$\ln p_h \ln$	.0369	2.47	.0305	1.67
CRBOOM1	-.00140	1.63	-.00176	2.08	$\ln p_l \ln$	-.687	3.76	-.729	3.56
$\ln p_h$	-.104	3.37	.0534	.37	$\ln p_d \ln$	.385	2.32	.532	2.52
$\ln p_l$	.280	1.22	1.49	1.39	$\ln p_w \ln$	-.0352	2.23	-.0338	1.92
$\ln p_d$	.770	4.05	-.887	.93	$\ln p_m \ln$	.300	3.95	.200	2.49
$\ln p_w$	.0760	4.53	.197	2.17	$(\ln x_F)^2$	-.0210	2.81	-.0216	2.78
$\ln p_m$	-.0229	.11	.150	.32	c_l			-.412	1.07
$\ln x_F$	-.00272	.52	-.0348	.58	c_d			-.516	1.20
$(\ln p_h)^2$	.0596	.73	.114	1.27					
$\ln p_h \ln p_l$	.137	.19	.287	.37	Profit	.5630		.5968	
$\ln p_h \ln p_d$	.514	.71	.0322	.05	Investm	.0143		.0028	
$\ln p_h \ln p_w$	.0770	.99	.0686	.97	Deposit	.0031		.0065	
$\ln p_h \ln p_m$	-.788	1.46	-.501	1.33	Wage eq.	.00085		.0034	
$(\ln p_l)^2$	10.4	1.94	13.1	2.04	Materials	.000033		.00042	

[1] Iterated SUR estimates, using profit and all share equations except that for loans.

While increasing the share of the loan portfolio backed by real property guarantees was found to have an unambiguously favorable impact on the delinquency rate, the effect takes on an inverted "U" shape in the case of profits, as shown by the coefficients of MORTGAGE and $(\text{MORTGAGE})^2$. The coefficient estimates for these two variables in both regressions 4 and 5 are such that the use of some mortgage guarantees (as compared to none at all) increases profits as long as total mortgage-backed loans constitute less than 79% of the overall loan portfolio. Profits are maximized in both regressions when mortgage loans are 39% of the total portfolio, which, incidentally, is virtually identical to the observed mean of MORTGAGE (Table 4). These 79% and 39% estimates do not vary much across different profit regression specifications, and thus appear to be quite robust point estimates. One implication of these results is that credit unions that secure nearly every loan - even small

loans for example - with a mortgage (as some CUs in our sample do) would appear to be engaging in a wasteful practice, with the additional administrative costs to the credit union associated with processing such credits outweighing the benefits of enhanced loan recovery (via either higher repayment rates or collateral forfeiture).

SAVER and NEUTRAL are dummy variables that equal unity when the credit union is saver dominated and neutral, respectively, and zero otherwise.[22] While SAVER is usually significant in the profit regressions, NEUTRAL is much less often so. We might expect these variables to impact profits positively through the delinquency channel since borrower-dominated credit unions would likely not only subsidize loan rates but also be less strict about loan collection. In fact, SAVER and NEUTRAL consistently have the requisite negative signs in the delinquency regressions, but with t-ratios of around unity, are not especially significant there. The significance particularly of SAVER in the profit regressions but not in the delinquency regressions is somewhat puzzling and may be explained by the fact that only 11% of the credit unions are classified as saver dominated, making it difficult to clearly identify the impact of this variable (in both regressions). Our fieldwork suggests an alternative or perhaps additional explanation as well. For a credit union to have made the transition from the traditional borrower-dominated form that almost all of them started with to being saver dominated usually has meant that the credit union has understood not only the importance of savings mobilization but also of other complementary principles such as managing the CU on a more business-like basis, which includes earning (and capitalizing) profits to buffer negative shocks and help fuel growth. This may account for the significant increase in profits observed in saver-dominated credit unions.

The four remaining intercept shifters are all macroeconomic variables, none of which are very significant in the delinquency regressions but all of which are at least reasonably significant in most of the profit regressions. The inflation rate (INFLAT) is easily the most significant of the four. Its presence may reflect the fact that with a given percentage reserve requirement, bank intermediation margins rise and therefore bank spreads also tend to widen as nominal interest rates rise with increasing inflation. This tendency will be even stronger if reserve requirements are increased, as they commonly are, to combat higher inflation. Since none of the credit unions in this study were subject to reserve requirements, higher inflation rates tend to improve the competitive position of the credit unions *vis-a-vis* commercial banks and other formal intermediaries and hence credit union profitability.

The growth rate of real GDP (GGDP) has the expected positive effect on short run profits, reflecting the existence of fixed capital in the profit function and perhaps of fixed overhead costs that do not vary with cyclical increases in business volume (e.g., building rent, equipment and software systems, insurance, etc.).[23] It may also be that during cyclical upturns, personnel work harder to accommodate this increased volume, generating labor productivity gains.

The absolute value of the percentage change in the real effective exchange rate (AREERCH) captures a major source of relative price change in these small, open economies. Larger changes may cause private firms to cut back on planned investments as they sense greater macroeconomic volatility.[24] This may lessen the demand for credit union loans and hence reduce profits.

The last macroeconomic variable, CRBOOM1, is defined by the formula given in Table 3. It measures whether the lagged increase in nominal commercial bank credit was sufficient to roll over all old credits and their interest payments and to meet the demand for all new credit arising from the growth of real GDP. Increases in credit beyond this level yield positive values for CRBOOM1 (i.e., a credit boom); increases below this level yield negative values for CRBOOM1 (a credit crunch). The hypothesis behind CRBOOM1 is that credit unions get caught up in credit booms along with the banks and expand their personnel capacity to accommodate the increased business volume.[25] The year after the credit boom, when economic conditions are often less buoyant,

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[22]Section 4 notes the data sources for these series.

[23]Most of the variation in our sample *is* cyclical, rather than cross-country. The average sample-period values of GGDP for Bolivia, Guatemala, and Honduras are 4.24, 4.24, and 3.60 percent, respectively.

[24]On the connection between real exchange rate volatility and aggregate investment, see for example Edwards (1989).

[25]We use bank credit growth and loan rates because we do not have good aggregate statistics for credit union loan rates in any of the three countries.

the credit unions may have difficulty cutting back on this additional capacity (both because of restrictive labor laws and the social orientation of the credit unions), which then reduces their profits. Conversely, when a credit crunch has taken place last year, the credit union may have initiated cost cutting measures, which may improve profits this year as more of the full force of these reductions are felt, often together with an economic recovery in the current year. This tends to force greater credit union output from a reduced stock of labor, thereby increasing productivity and profits. This argument may explain the significantly negative sign for CRBOOM1 we find consistently in the profit regressions.

We now turn to the price policy variables. Given that the logarithmic price and fixed capital variables have all been centered around their means, it is straightforward that in both equations (1) and (5), $\partial \ln p / \partial \ln p_i = a_i$ for any netput *i* at the point of sample means. The usual monotonicity argument would imply that these partial derivatives and therefore the a_i coefficients should be positive for output prices (since increasing the price of investments or loans should increase profits) and negative for input prices (since increasing the price of deposits, labor, or materials should decrease profits). However, since a posted loan rate is used in this study instead of an implicit loan rate, in order to allow prices and other variables to affect profits through the delinquency channel, these monotonicity results need not necessarily hold, as we now discuss.

In most regressions, including those in Table 5, the usual monotonicity condition *does* hold for the loan price variable at the point of means, as it should since in addition to the normal direct impact on profits of an increased output price, higher loan rates are also associated with lower delinquency rates (Section 5), reinforcing the positive impact on profits. The most consistently-signed price variable in the profit regressions was that for wages, which had a positive sign in every profit regression we ran, and was almost always very significant as well. This is a strong efficiency wage result, and one that parallels the salutary effect of higher wages on delinquency which was found in the Section 5 regressions. It provides further evidence that, in the main, credit unions would benefit from paying higher wages in order to attract and retain better qualified personnel and better motivate them; doing so will actually increase profits, as the increased wage bill will be more than offset by reduced loan delinquency and perhaps by such things as better financial management, reduced turnover costs (retraining, etc.), and general increases in labor productivity. Higher deposit rates are often associated with *higher* profits in the regression analysis, as they are in regression 4, reflecting the Section 5 result that higher deposit rates motivate loan repayment. The investment and materials price variables are often very insignificant at the point of means, possibly reflecting multicollinearity problems or measurement errors in the series.

The point estimates for the regression 5 slack parameters, c_d and c_l, are -0.52 and -0.41, respectively. These values indicate that compared to an efficient (conditional profit maximizing) credit union, the credit unions in this sample mobilized about 50% less in deposits and made about 40% less in loans. Even though variants on regression 5 involving different sets of intercept shift variables yielded estimates for c_d and c_l rather consistently in the -0.3 to -0.5 and -0.2 to -0.4 ranges, respectively, all of these parameter values should be taken as quite preliminary. When the slack profit regressions were run with only the c_l parameter, the estimated values for c_l clustered around -0.1 (with standard errors of less than 0.05).[26] These and other estimates rather consistently supported the hypothesis that the credit unions in this sample were mobilizing less in deposits, making less in loans, and generally using/generating less of all five of the inputs and outputs than an efficient credit union would at the given vector of prices. The regressions are far less consistent, however, in their estimates of the percentage shortfalls, with many of the estimated values not statistically significant. The interpretation of these results is that the credit unions operate on a generally reduced scale even given their deposit rates and other prices. This appears to reflect administrative inefficiencies, perhaps in such areas as deposit mobilization, loan extension and collection, and personnel and overall management of the institution.

Like those of the delinquency regressions, the profit equation R^2 values generally fall in the 0.55 to 0.60 range, very substantial considering how erratic the delinquency rates and profit levels are from year to year and credit union to credit union (with great variation persisting even when profit levels are normalized by fixed or total assets to adjust for varying credit union size). The profit "share" equations consistently had R^2 values near zero, which is due at least in part to the fact that at profit levels near zero the shares become unstable and can swing

[26] Estimating profit functions with more than two slack parameters gave erratic results and a high frequency of non-convergence problems.

between very large negative and positive values from small changes (e.g., measurement errors) in calculated profits. In general, the parameter estimates were not greatly affected by the inclusion or not of the share equations, though the standard errors did tend to be smaller when they were included and the iterated SUR estimator was employed.

7. Conclusions

This paper has presented conceptual frameworks for explaining credit union loan delinquency and profitability, followed by empirical estimation and discussion.

Delinquency was hypothesized and found to depend in important ways on the incentives credit unions create for their borrowers to repay loans. These incentives range from the loan and deposit rates the credit union sets, to the overall financial health of the credit union, to the use of loan collateral and the extent to which the credit union creates a serious culture of loan repayment. Certain other credit union policy variables which operate only partially through borrower incentives were also found to be important. Chief among these is the relative wage rate between credit unions and other financial institutions.

Profitability was explained first within the framework of a traditional translog profit function. This was shown to be admissible as long as the credit union's only departure from profit maximization was to alter prices (loan or deposit rates) so as to favor borrowers or savers. Further departures from efficiency were modeled using a profit function analogue to Mester's (1989) separable-expense-preference cost function. Within either framework, credit union price and delinquency control policies were found to be important determinants of profitability. So important was the issue of delinquency control to maintaining profitability that higher wage rates and often higher deposit rates were found to increase profitability in part because of their beneficial impacts on loan repayment, despite the fact that raising these rates directly increases costs.

This paper has provided a number of important guidelines for the successful operation of credit unions in developing countries. Our results also have implications for the monetary authorities in these countries. Given the importance of higher interest rates in both reducing delinquency and increasing profitability, interest rates ceilings should be avoided in order to avoid damaging credit union financial health. Also to be avoided are subsidized, targeted credit programs that undermine the adoption by credit unions of higher, market-based deposit and loan rates. Some of the potential benefits of credit union supervision are also indicated by our results, which suggest that stricter loan collection standards and a more business-like management of the CU could significantly improve delinquency rates and profitability.

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